

A project of Volunteers in Asia

Better Freshwater Fish Farming: The Fish

By: FAO Better Farming Series

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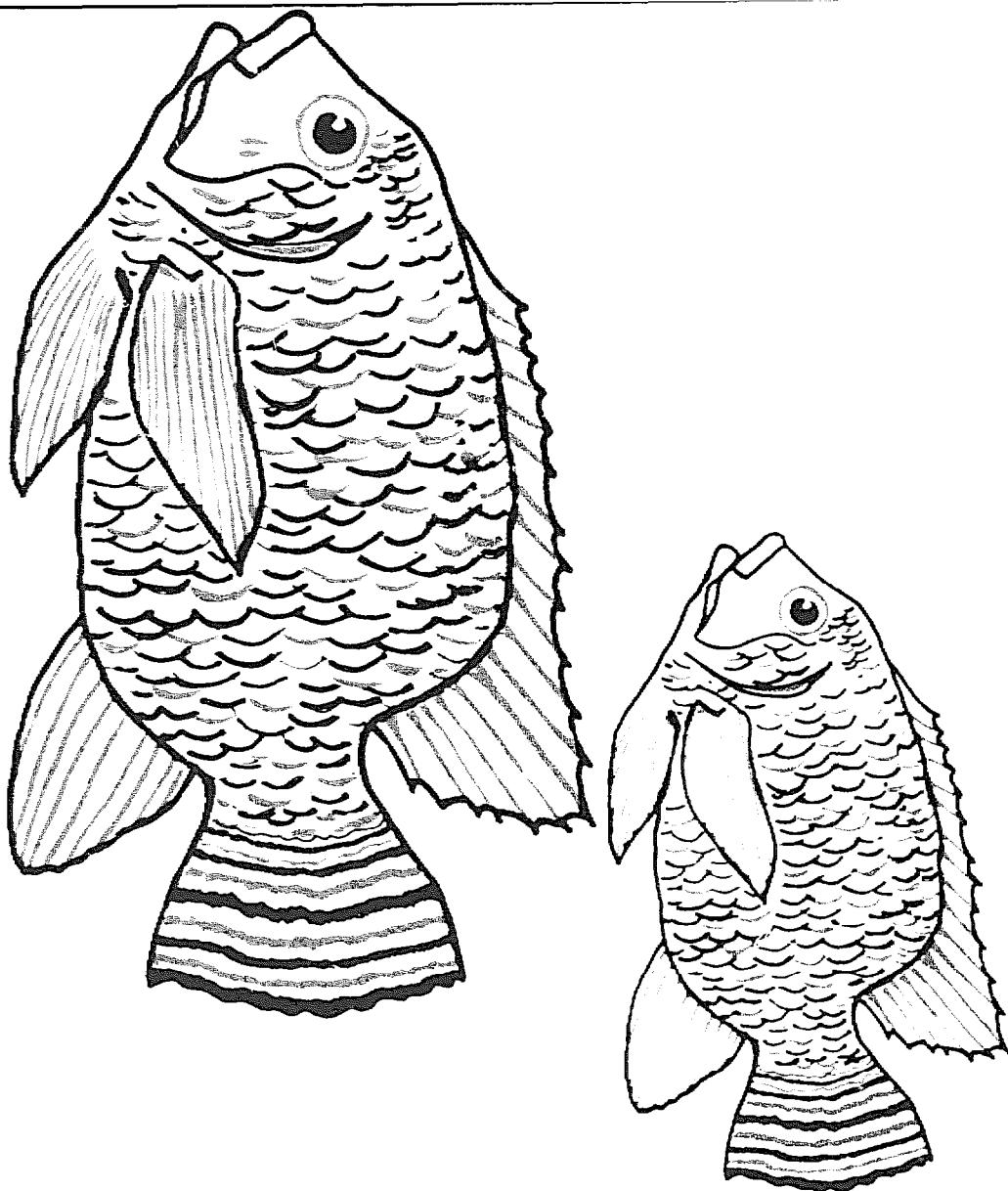
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# better freshwater fish farming

the fish



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# Better freshwater fish farming

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## PREFACE

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FAO's Better Farming Series is essentially based on the **Cours d'apprentissage agricole** prepared in the Ivory Coast by the **Institut africain de développement économique et social** for use by extension workers in contact with illiterate or semi-literate farmers. The approach is deliberately a general one, the intention being to constitute basic prototype outlines, to be supplemented in each area according to local conditions of agriculture.

Many of the booklets deal with specific crops, while others, such as this one, are intended to give the farmer information concerning the general agricultural context, and thus to allow him to gain some understanding of why he does what he does, so that he will be able to do it better.

Adaptations of the series, or of individual volumes in it, have been published, among others, in Amharic, Arabic, Bengali, Creole, Hindi, Igala, Indonesian, Kiswahili, Malagasy, SiSwati and Turkish, an impressive list which is some indication of the success and also of the value of the series. This volume has been prepared by the Inland Water Resources and Aquaculture Service, Fishery Resources and Environment Division of the Food and Agriculture Organization of the United Nations.

Requests for permission to issue this manual in other languages and to adapt it according to local climatic and ecological conditions are welcomed. They should be addressed to the Director, Publications Division, Food and Agriculture Organization of the United Nations, Via delle Terme di Caracalla, 00100 Rome, Italy.

# **OUTLINE OF COURSE**

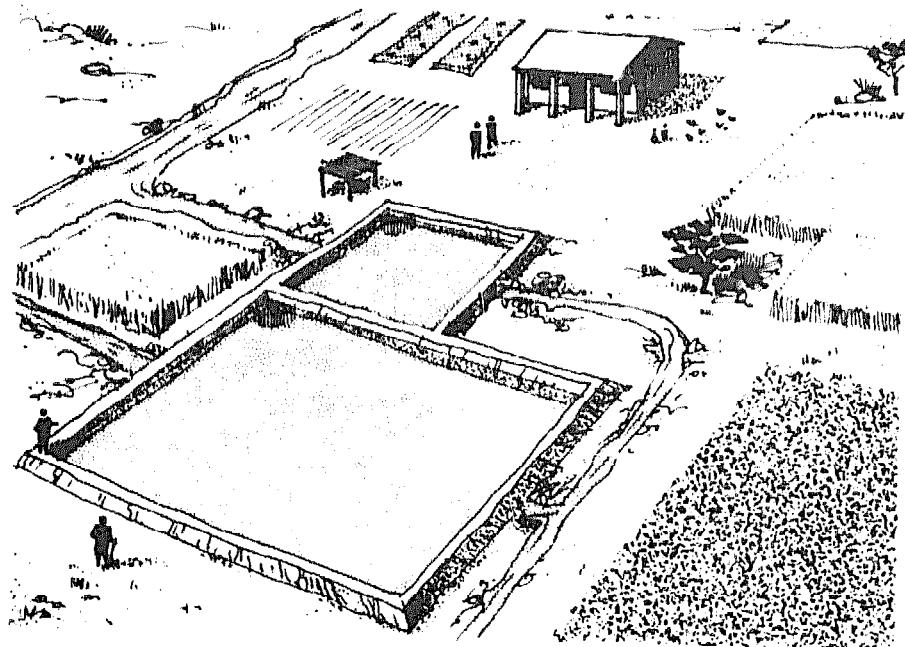
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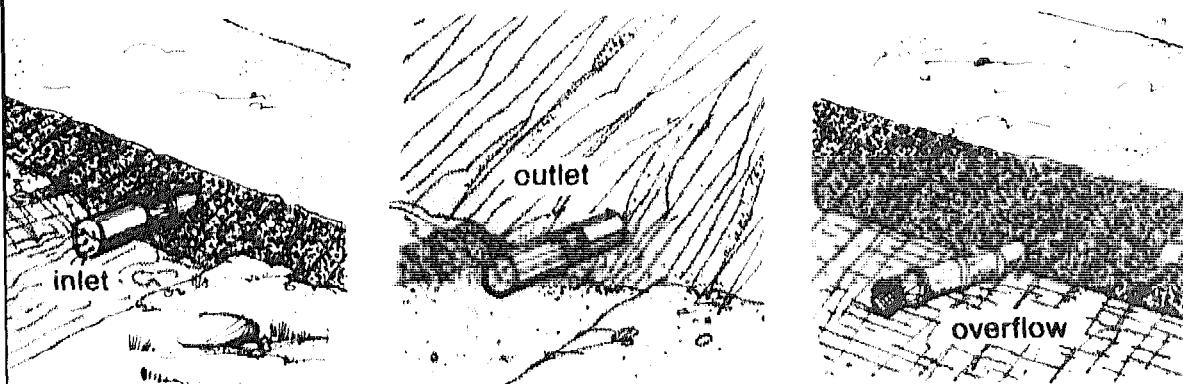
# **INTRODUCTION**

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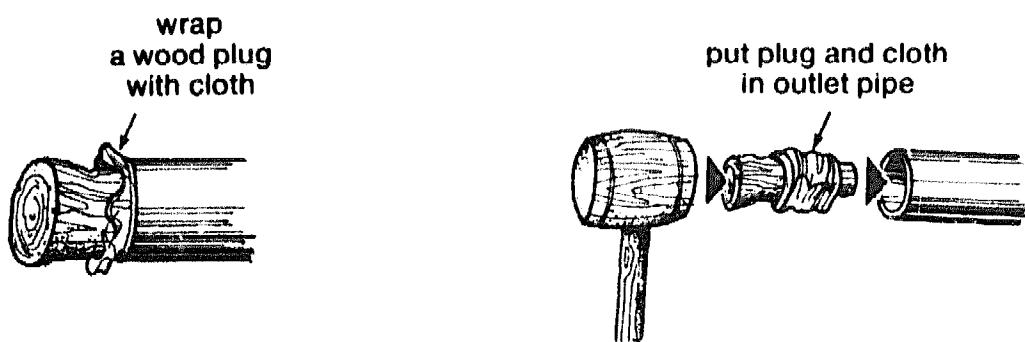
- 1. You have built the new bigger pond described in Booklet No. 29,  
Better freshwater fish farming: the pond.**



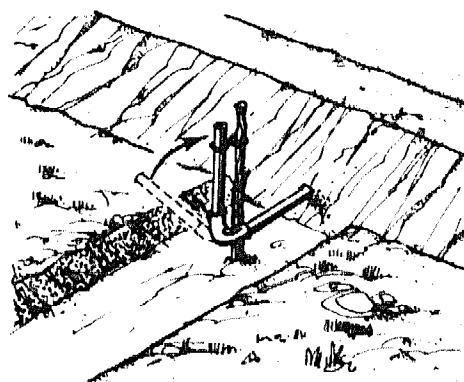
- 2. Before you let the water into your new pond, there are a few things that you must do.**
- 3. Make sure that the screens on the inlet, outlet and overflow are in place and tight.**



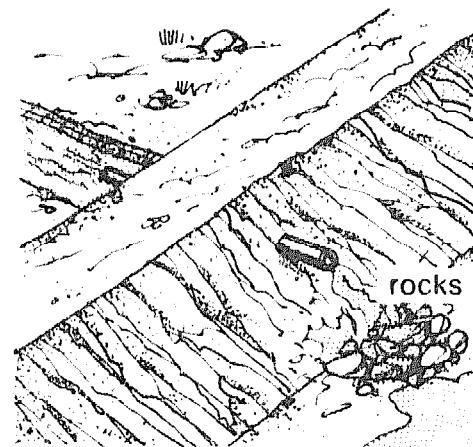
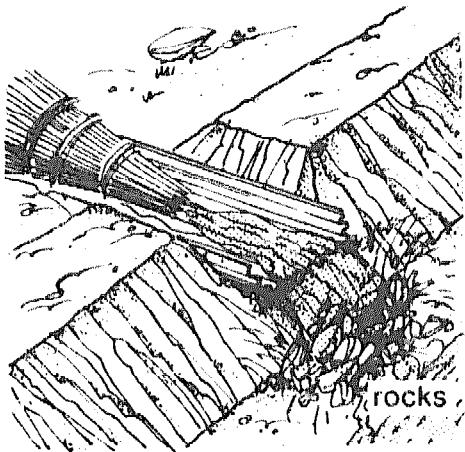
4. Make sure that the outlet is tightly closed.  
To do this,  
wrap a wood plug with old cloth,  
put it in the outlet pipe  
on the outside of the pond  
and tap it lightly with a hammer  
so that it will stay in the pipe  
when the pond fills with water.



5. If you have built a better outlet with a T or an L piece (see Booklet No. 29, Items 97 to 101), turn it to the upright position.



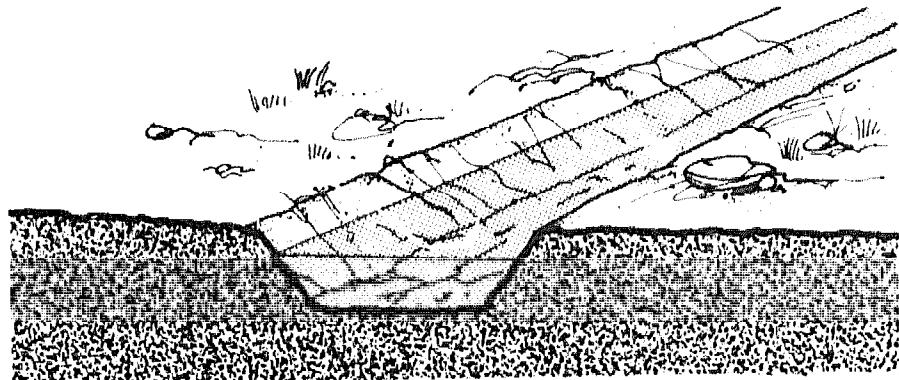
6. Put rocks on the bottom of your pond under the inlet where the water will fall when it begins to come into the pond.



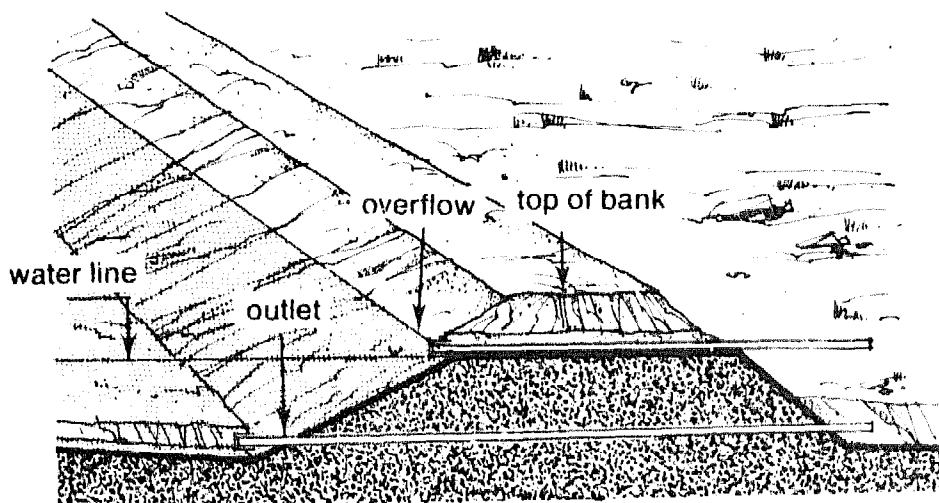
7. This will keep the bottom from washing away.  
It will keep the water from getting too muddy.  
It will make the water splash when it first comes into the pond and bring air for the fish to breathe.
8. Now you are ready to fill your pond.

## **Filling your pond with water**

- 9. Dig a small ditch  
from the water source to the inlet  
to bring the water to your new pond.**

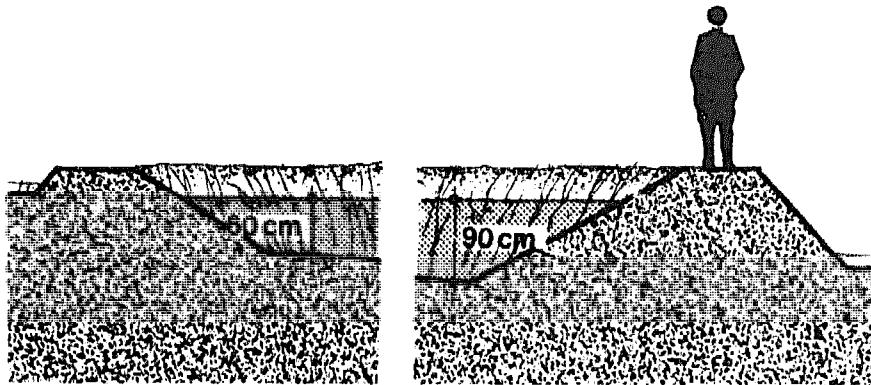


- 10. Let the water run into the pond  
until it reaches the level  
of the overflow pipe  
on the inside of the pond.**

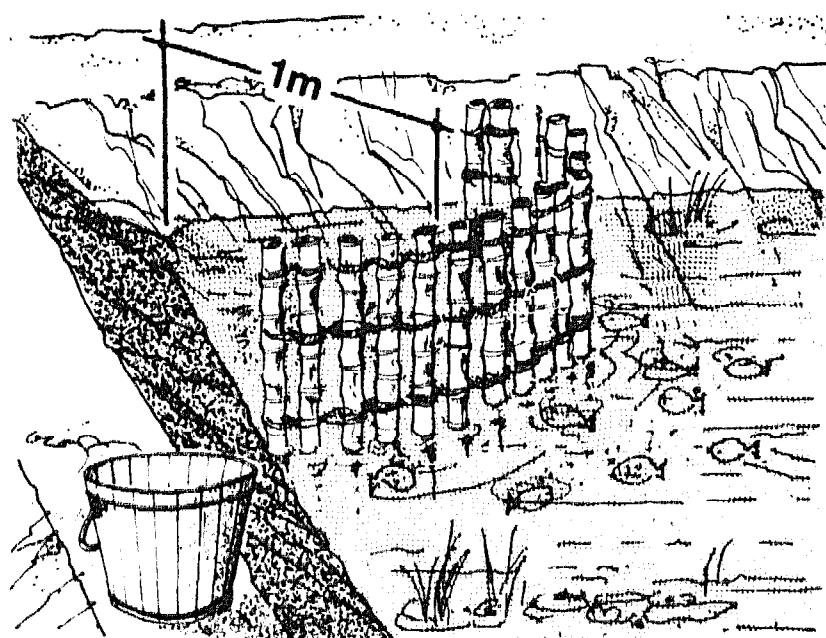


- 11. If your inlet pipe  
is about 10 centimetres in diameter,  
you will need about half a day  
to fill your pond.**

12. When the water reaches the level of the overflow pipe it will be about 60 centimetres deep at the shallow upper part of the pond and about 90 centimetres deep at the deepest part.



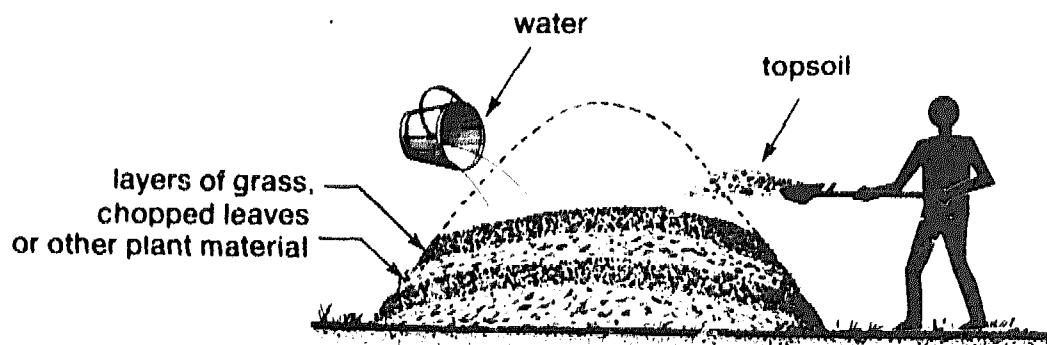
13. Now you are ready to fertilize the water in your pond.
14. Build a crib from bamboo or wood to hold the fertilizer as you did with your first small pond. Build it in one corner in the shallow part of the pond. The drawing below will show you how.



## **Fertilizing the water in your pond**

15. You can fertilize the water in your new pond with

  - compost made with animal manure
  - compost made with plant material
  - animal manure
  - plant material.
16. You can fertilize your new pond with animal or plant compost in the same way as you did with your old small pond.
17. Items 56 to 66, in Booklet No. 27, tell you how to make animal compost. If you do not have animal manure, you can fertilize your pond with compost made with plant material.
18. To make compost with plant material make a compost pile using layers of grass, chopped leaves or other plant material mixed with a little topsoil and damp it with water to make it rot faster.

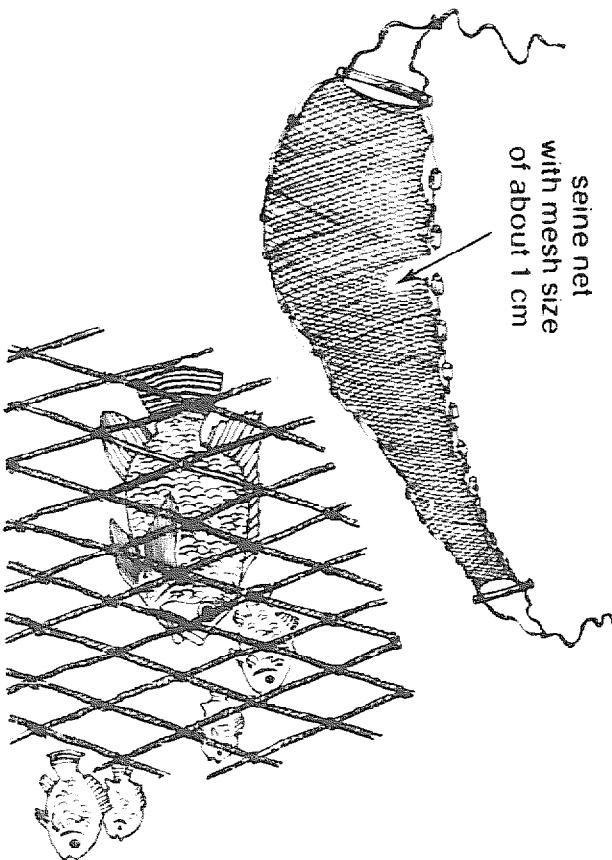


## Moving your baby fish

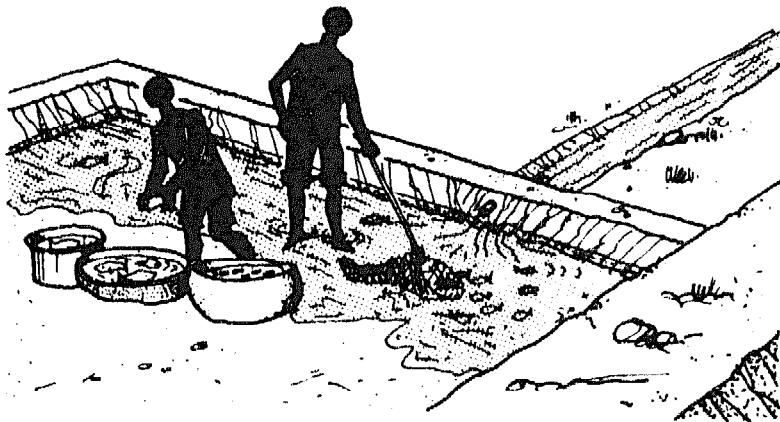
71. After about three months,  
there will be many baby fish  
of different sizes in your pond.  
Then you can begin to take baby fish  
out of your nursery pond  
to put into your big pond.

72. Use baby fish  
which are 5 centimetres or longer  
to put into your big pond.  
If there are many baby fish  
which are 5 centimetres or longer,  
choose the biggest ones  
to put into your big pond.

73. The easiest way  
to take out your baby fish  
is to use a seine net.  
If you use a seine net  
with a mesh size of about 1 centimetre  
the smaller fish will swim through  
and you will catch  
the fish of 5 centimetres or longer.  
But be sure to put the fully grown fish  
back in your nursery pond.

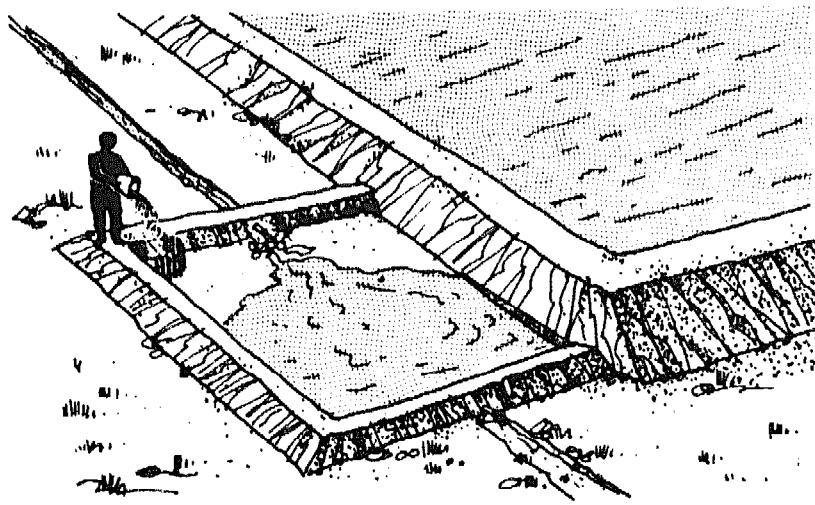


74. From now on,  
you can take baby fish  
out of your nursery pond each month  
for your own use or to sell.
75. Be careful that your nursery pond  
does not become too full of fish.  
If there are too many fish,  
they will not grow well  
and your baby fish  
will not be strong and healthy.
76. To keep your nursery pond  
from becoming too full of fish,  
drain all of the water  
out of the pond each year  
and collect all of the fish.



77. You can eat the big fish  
that were in the nursery pond.  
Item 144 in this booklet  
will tell you what to do  
with the baby fish.
78. Wait until the bottom  
of the nursery pond is dry,  
then clean and repair  
the bottom and the banks.  
Items 145 to 148 in this booklet  
will tell you how.

79. Now fill the nursery pond with water and fertilize it as you did before. When the water is green, put in the right number of fully grown female fish and male fish. Items 56 to 58 in this booklet will tell you how many fully grown fish to use.



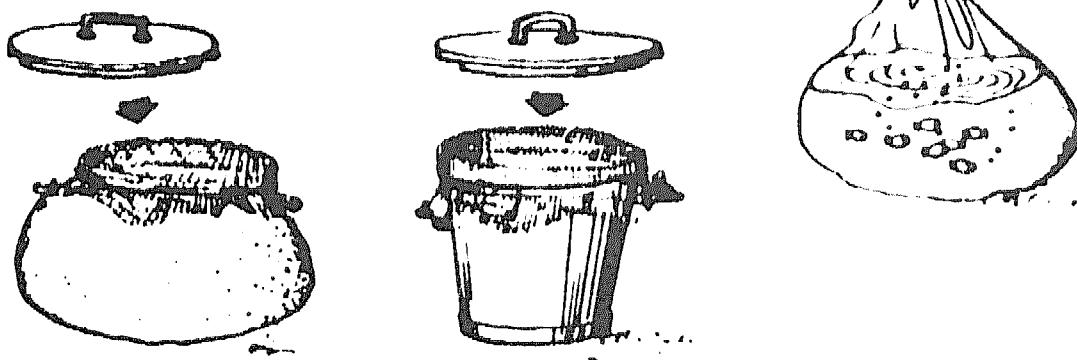
80. In about three months, you will be able to take more baby fish out of your nursery pond.

### **Carrying your baby fish**

81. You must be very careful when you carry your baby fish from one place to another. Baby fish can be hurt easily.

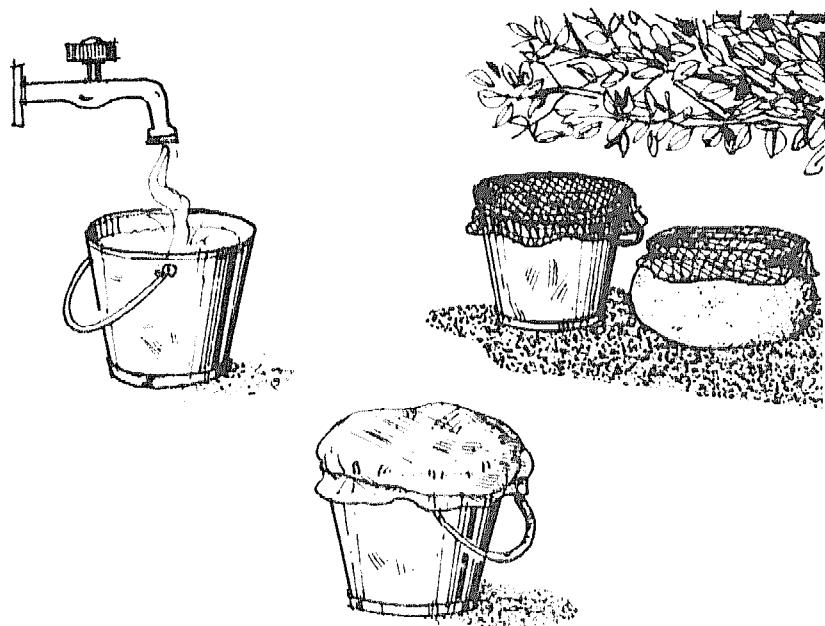
82. When you take the baby fish out of your nursery pond using a seine net, do not carry them in the seine net. Carry them in a container such as

- a clay pot with a cover
- a bucket with a lid
- a plastic bag.

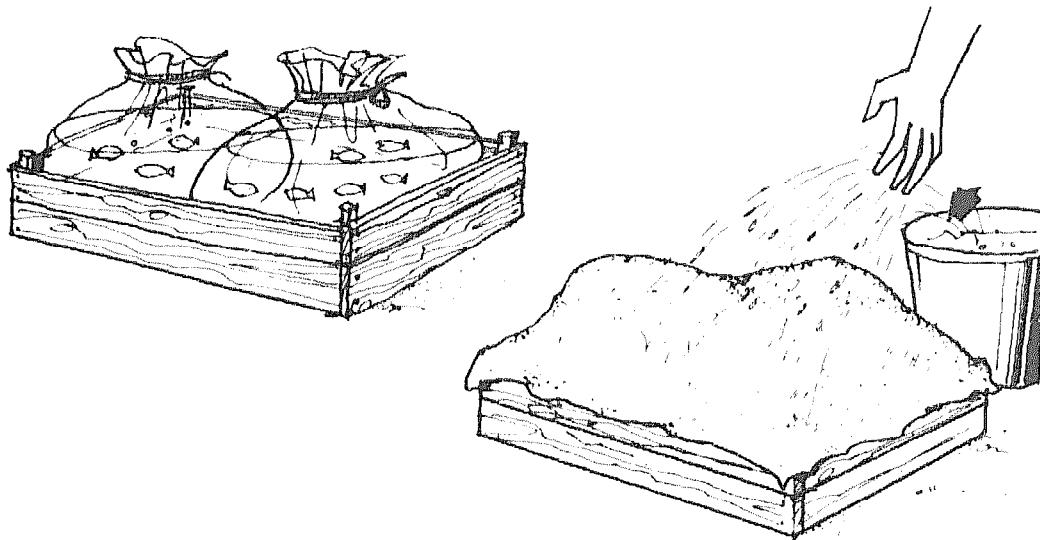


83. When you carry baby fish, you must be careful to

- use only clean water
- keep the fish out of the sun or cover the container with a wet cloth to keep it cool.

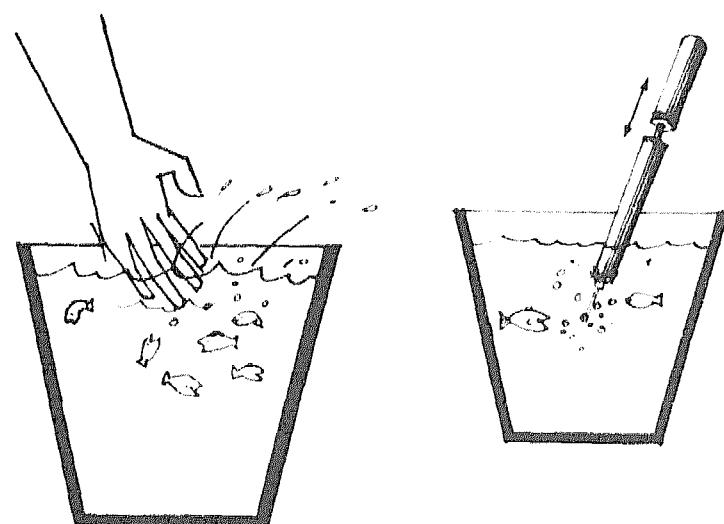


84. If you carry your baby fish in plastic bags, carry the bags in a box so that they will not break. Cover the box and the plastic bags with a wet cloth to keep them cool.



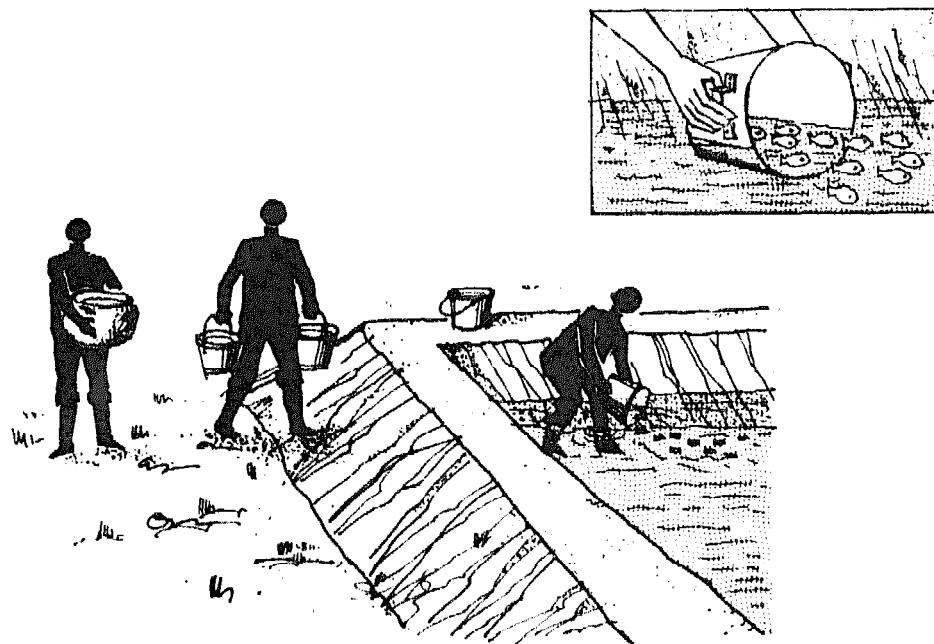
85. If you see that the baby fish are gasping for air, put some air into the water from time to time by

- splashing the water gently with your hand
- forcing air into the water with a bicycle tire pump.



## **Putting baby fish into your big pond**

86. When your new big pond is full of water, you have fertilized it and the water has become green enough, you are ready to put in the baby fish.
87. You already know that if you use *Tilapia nilotica* in a pond 15 by 15 metres, you will need 450 baby fish which are 5 centimetres or longer.
88. Put the baby fish gently into your big pond as you did with your first small pond. Items 70 to 76, in Booklet No. 27, will tell you how.



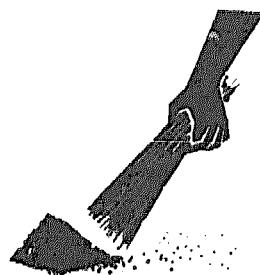
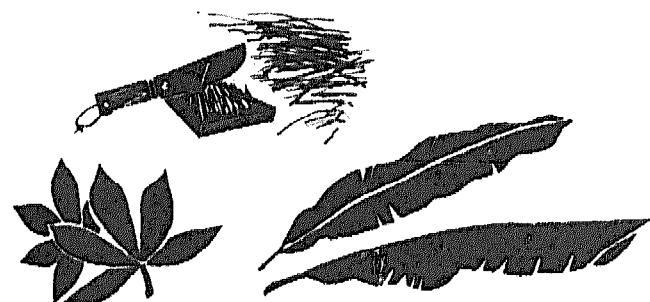
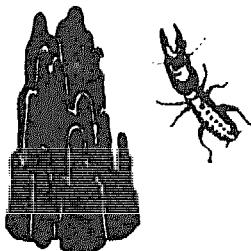
## **Feeding your big fish**

89. You already have learned that the big fish in your pond will get much of their food from small plants and animals which grow in the green water.

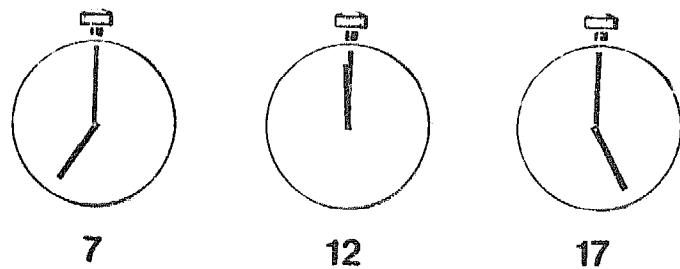
90. To keep the water green,  
do not forget  
to put a bucket of fertilizer  
in the crib  
In your pond each week.  
If you are using  
plant compost or plant material,  
keep the crib filled to the water line.

91. To make your big fish grow more quickly,  
you must also feed them  
other kinds of food.  
You can feed them

- termites
- tender leaves and waste  
of banana and cassava
- grain mill sweepings
- rice bran
- beer wastes
- cottonseed or groundnut cake
- slaughterhouse wastes
- animal wastes
- kitchen wastes
- spoiled fruit and vegetables
- left-over food
- chopped grass.



92. With your old small pond, you fed your fish only once a day. But your fish will eat better and grow faster if you feed them two or three times during the day.
93. Prepare all the food for one day's feeding at the same time and give the fish part of the food at two or three different times during the day.
94. **Always try to feed your fish at the same times every day.**

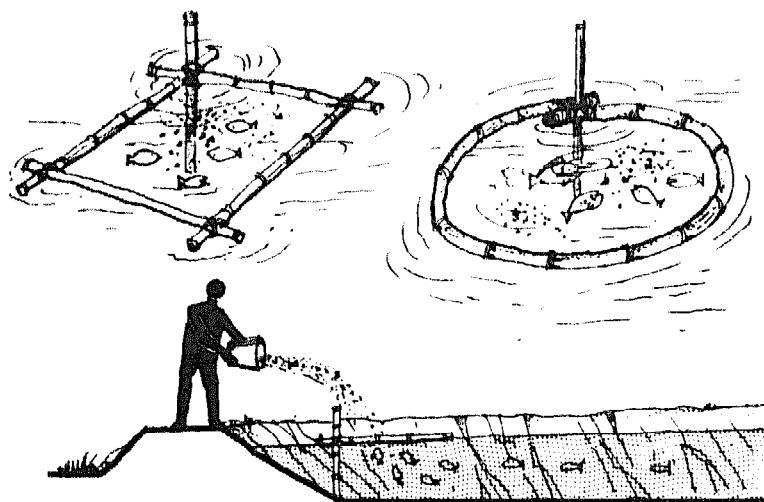


95. The bigger your fish grow, the more food they will need. If your pond has 450 fish in it, feed them
  - 500 to 900 grams of food every day during the first month
  - 900 to 1 200 grams of food every day during the second month
  - 1 200 to 1 600 grams of food every day during the third month

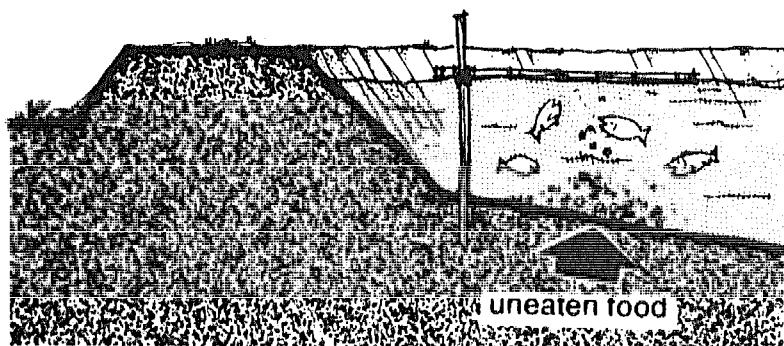
- 1 600 to 2 000 grams of food every day during the fourth month
- 2 000 to 2 700 grams of food every day during the fifth month
- 2 700 to 3 500 grams of food every day during the sixth month and until the time that you harvest your fish.

96. It is not easy to know exactly how much food to feed your fish. You must watch them when they eat to learn how much food they need.
97. Feed your fish in the shallow part of the pond so that you can see them eat.
98. If you see that the fish do not eat all of their food, give them a little less the next day.
99. If you see that the fish eat all of their food quickly, give them a little more the next day.
100. If you feed your fish at the same place every day, you will see whether the fish are eating well. If you give them too much, the food which is not eaten will stay on the bottom.
101. Too much uneaten food on the bottom of the pond will take the air out of the water.

102. To make it easier to see if your fish are eating well, mark several places in your pond to feed them.
103. Mark each place by making a square or a ring of light wood or bamboo. Drive a pole into the pond bottom and attach the square or ring, as shown in the drawing.



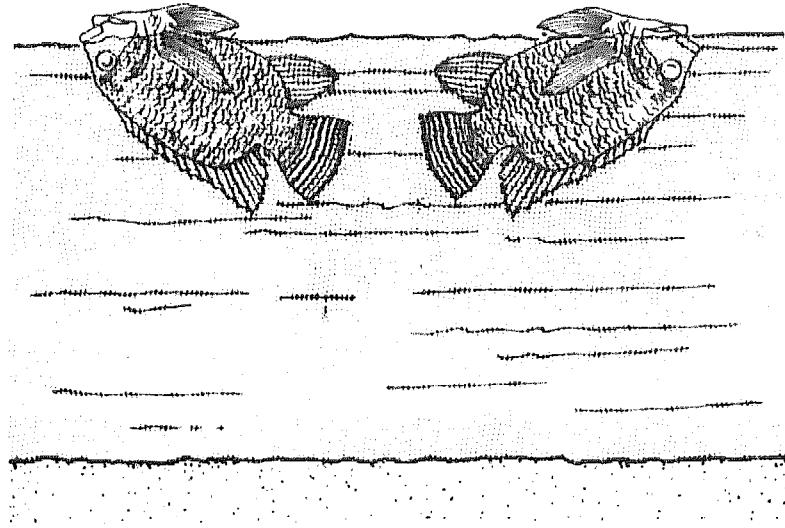
104. When you feed the fish, put the food inside the square or ring. You may be able to see any uneaten food on the bottom under the square or ring. If you cannot see the bottom, feel with your hands to find any uneaten food that may be there.



## **TAKING CARE OF YOUR FISH**

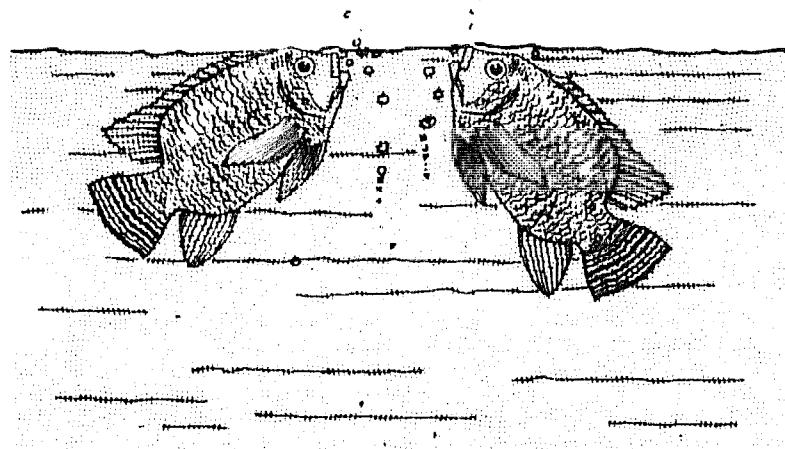
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105. You must take very good care of your fish.  
Watch them carefully to see that they are healthy and swimming strongly.
106. If you find any dead fish floating in your pond, take them out right away and change some of the water in your pond.



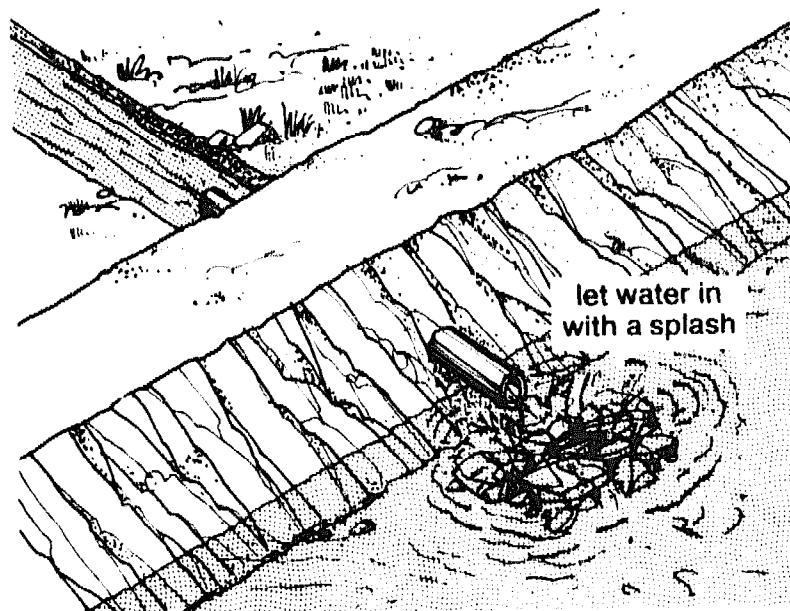
107. To do this, open the inlet and let in some new clean water. The old water will drain out of the pond at the overflow. Do this for 2 or 3 hours each day for several days until you see that your fish are well.

108. If the weather is too hot,  
if you feed your fish too much,  
or if you put too much fertilizer  
into the pond,  
there may be too little air  
in the water  
for your fish to breathe.
109. If you see your fish  
coming to the surface  
gasping for air,  
give them less food  
and do not put any fertilizer  
into your pond for several weeks.



110. Put more air  
into the water of your pond  
by changing some of the water  
for several days,  
as you did in Item 107  
in this booklet.

111. When you let new water into the pond,  
let it in quickly  
so that it will come with a splash  
and bring more air into the water.  
This will help your fish to breathe easily.



112. If you see any other things wrong  
with your fish  
that you do not understand,  
stop feeding them  
and stop putting fertilizer  
into the pond.  
Then change some of the water  
in your pond  
every day for several days,  
as you did in Item 107  
in this booklet.
113. After several days  
if your fish are still not well,  
if they are not eating well  
or gasping for air  
or are not swimming strongly,  
ask your extension agent  
or your fish culture station for help.

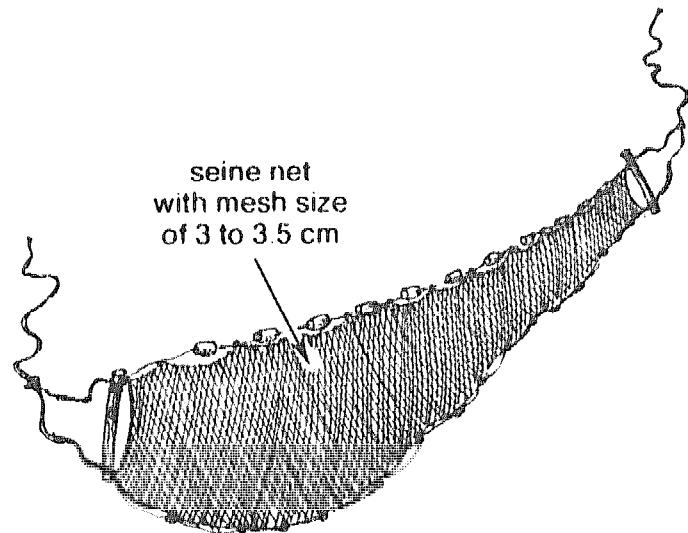
## **HARVESTING YOUR FISH**

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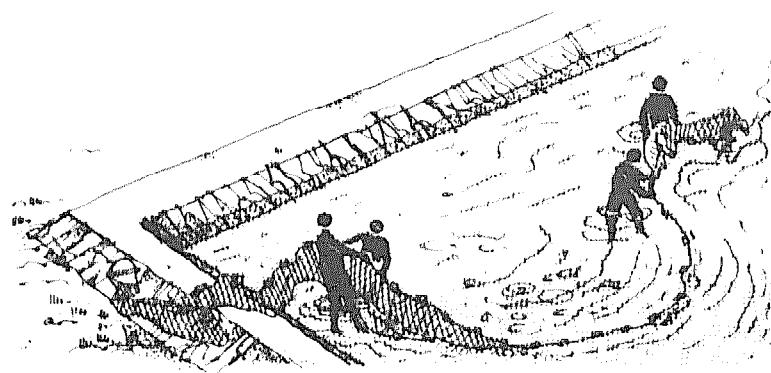
114. When you harvested the fish in your first small pond, you first drained all of the water out of the pond. Then you collected the fish. Items 91 to 98, in Booklet No. 27, tell you when and how to do this.
115. But there are several ways to harvest your fish. You can harvest them
  - without draining the water
  - by draining all of the water
  - by draining part of the water.
116. Here are some things that you should know about these different ways of harvesting your fish.

### **Harvest without draining the water**

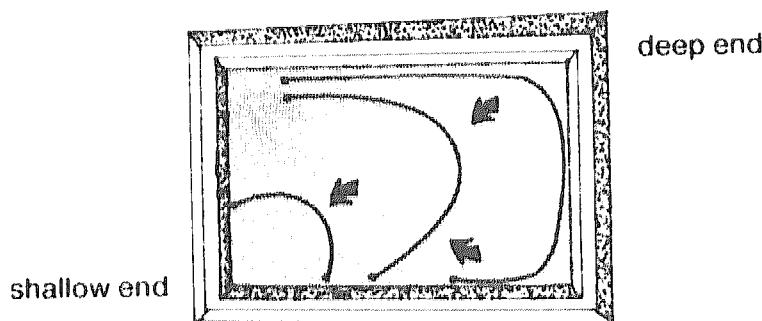
117. If you do not have enough water to fill your pond again and you want to harvest only part of your fish, you can use a seine net to gather them without draining the water.
118. A seine net with a mesh of 3 to 3.5 centimetres will catch the biggest fish and allow the small fish to escape through the net.



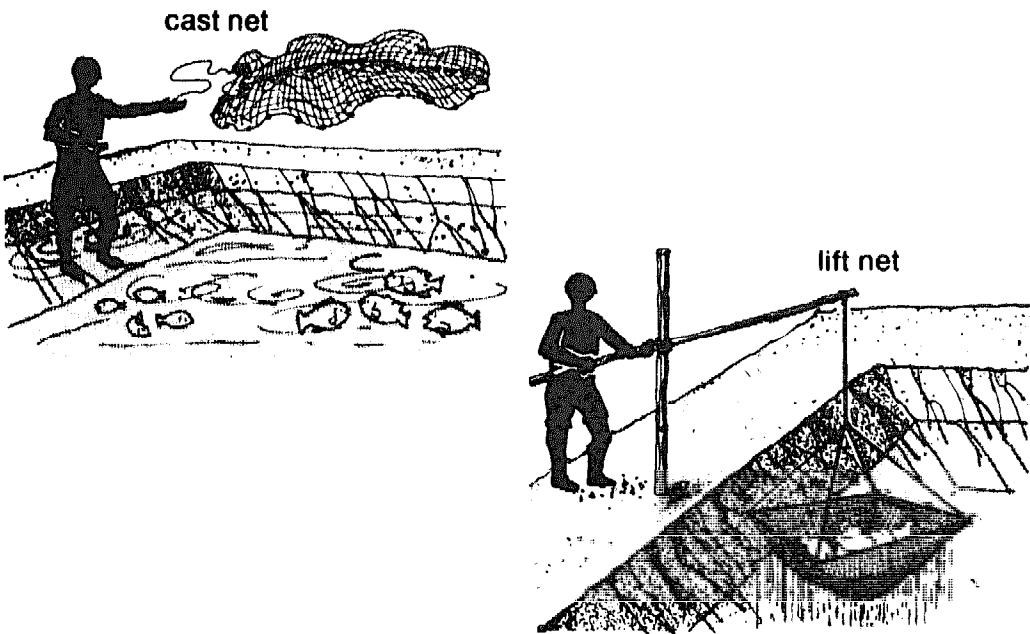
119. You will need several people to harvest with a seine net. Perhaps your family can help you. Perhaps you can ask your neighbours for help, and later help them with their work or give them some fish to pay them for their help.



120. Start at the deep end of the pond and pull the seine net slowly toward the shallow end. The drawing shows you how.



121. You can also use a cast net or a lift net to harvest some of the fish from your pond without draining the water.

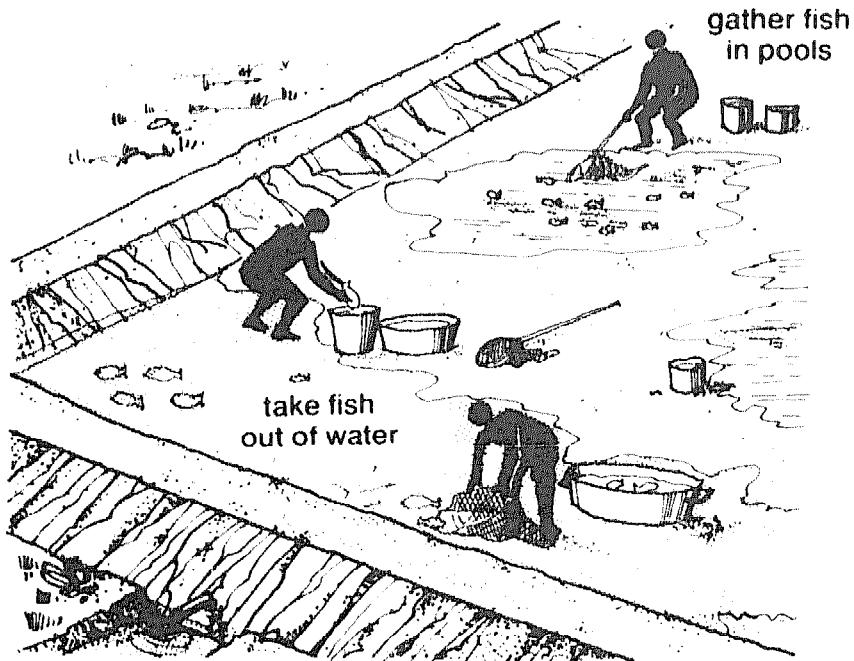


122. With a cast net or a lift net, it is easier to catch the fish while they are eating and they are all together. Keep the biggest fish and put the smaller fish back into the pond.

#### **Harvest by draining all of the water**

123. If you have enough good water to fill the pond again, it is best to drain all of the water. If you drain all of the water, you will be sure to catch all of the fish and you can clean the bottom of your pond.

124. While the pond is being drained, use baskets or hand-nets to take the fish out of the water. After all of the water has been drained from the pond, you may still find small pools here and there on the bottom. Be careful to gather all of the fish in the pools.



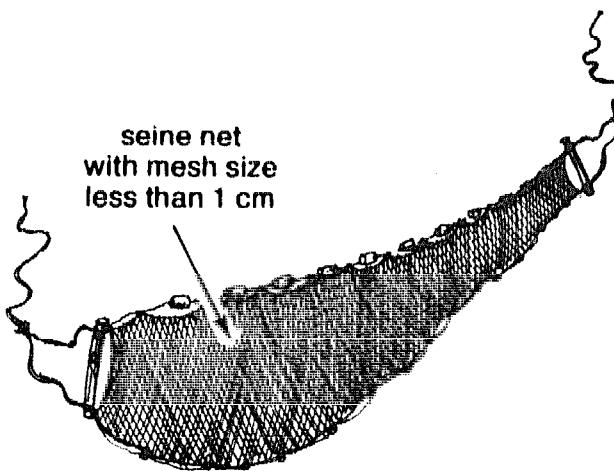
#### **Harvest by draining part of the water**

125. If you have only enough water to fill part of your pond, do not drain out all of the water. Drain only part of it out.

126. Pull the wood plug closing the outlet, or, if you are using a siphon, put the siphon in place and begin to let the water out.

127. Let half the water flow out through the outlet or siphon. Then put the plug back in the outlet or remove the siphon.

128. Now you can begin to harvest your fish with a seine net.  
Do it the same way as you did in Item 119 in this booklet.  
If you have a seine net with a mesh size of less than 1 centimetre, you will be able to catch all of your fish.



129. Take all the big fish and put the small fish back. If you have too many baby fish, Item 144 in this booklet will tell you what to do with them.

130. When you are finished harvesting, let water flow back into the pond until it reaches the level of the overflow pipe.

#### **What to do with your big fish**

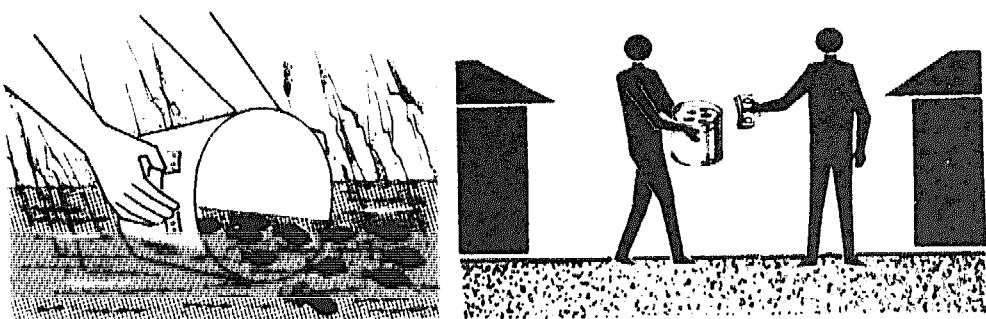
131. You will harvest more than twice as many big fish from your new big pond as you did from your old smaller pond.

132. When you harvest your big fish,  
you must be ready to eat them  
or sell them or preserve them  
the same day.  
Items 105 to 112, in Booklet No. 27,  
will tell you what to do.

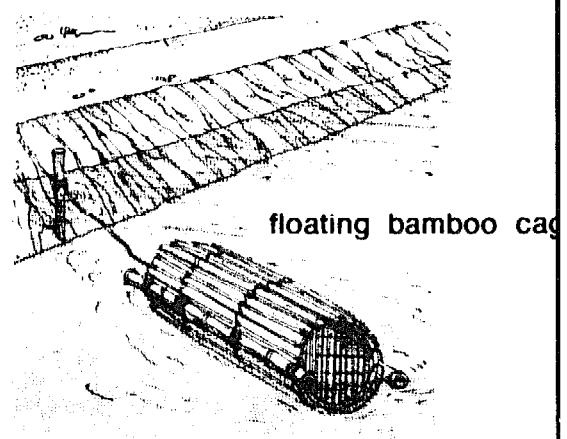
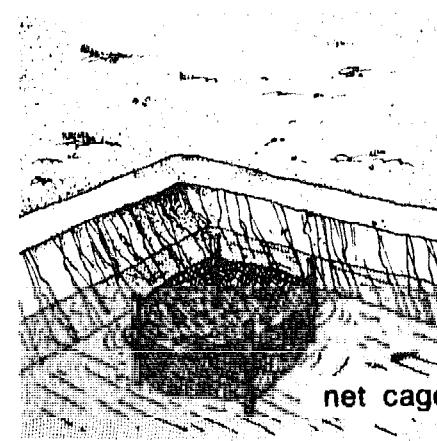
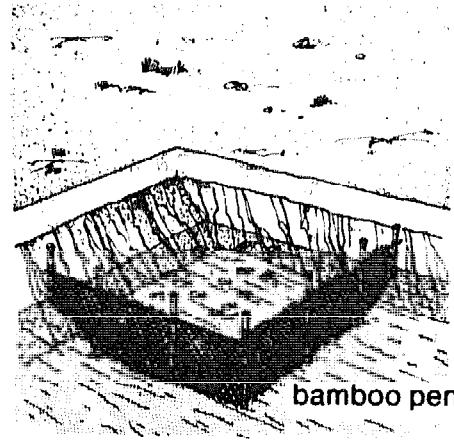
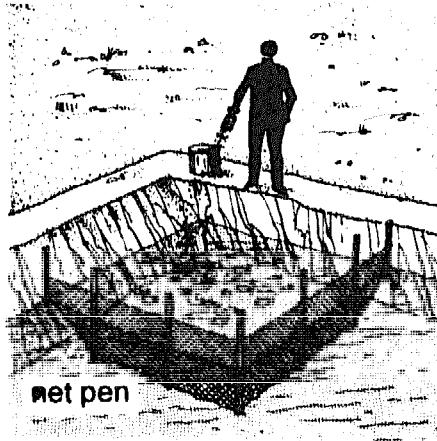
### **What to do with your baby fish**

133. When you harvest your pond,  
you will also catch many fish  
that are too small to eat  
or to be sold at the market.

134. If you have not built a nursery pond,  
you may need some of these baby fish  
to put back into the big pond  
you are harvesting.  
You may also be able  
to sell some to another fish farmer.  
But you must take good care  
of the baby fish  
until you are ready  
to use them or sell them.



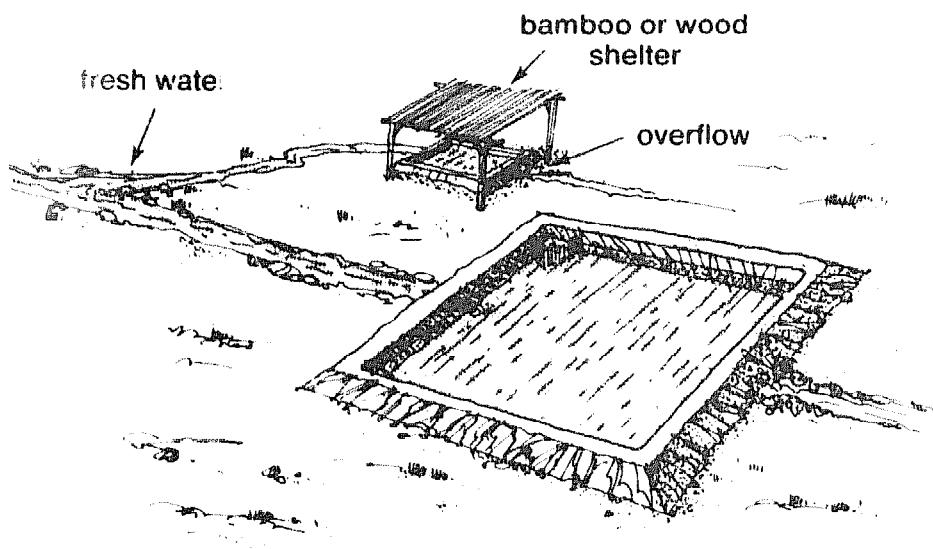
135. If you have another pond that is full of water, you can put these baby fish in a pen of split bamboo or net in the corner of the other pond. You can also keep these baby fish in a net pen or in a floating cage of split bamboo.



136. If you do not have another pond, you should keep the baby fish alive in a special small pond nearby, until you are ready to use them, as you did when you harvested your first small pond (see Booklet No. 27).

137. The smallpond  
can be a simple hole in the ground  
about 3 by 3 metres  
and about 40 centimetres deep.  
You should have it ready  
before you begin to harvest.

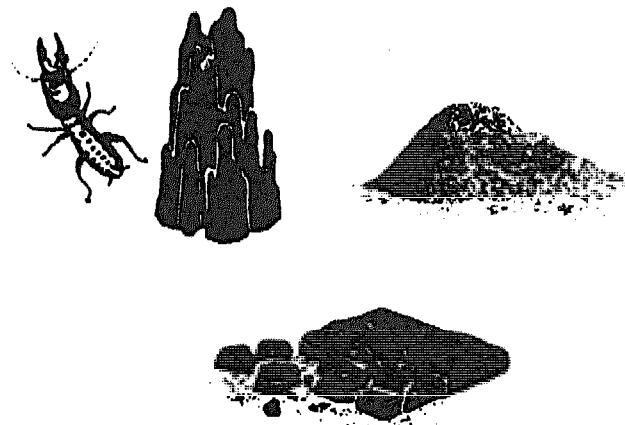
138. Your baby fish will stay alive longer  
if they are out of the sun.  
Build the small pond in the shade,  
under a tree  
or put a shelter over it.  
You can build a simple shelter  
using bamboo or wood.



139. Your baby fish will stay alive longer  
if they have fresh water.  
Build the small pond with an overflow  
and put the small pond near the ditch  
which brings water to your big pond.  
That way you can have fresh water  
running through your small pond.

140. You can also let fresh water  
into your small pond  
with a small ditch or a siphon.

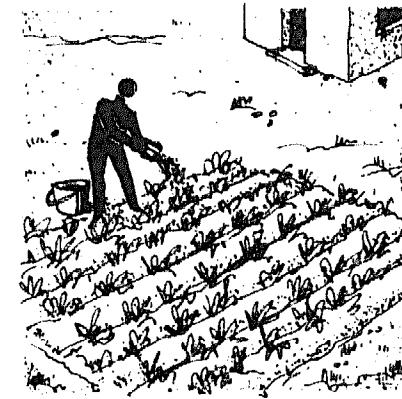
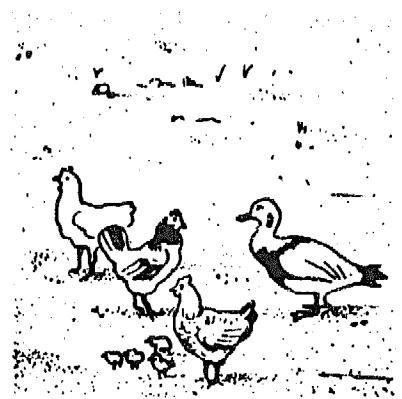
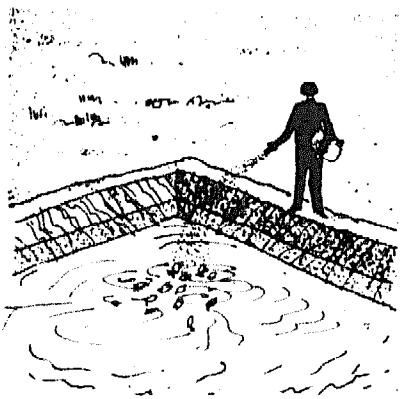
141. Your baby fish will stay alive longer if you feed them a little food each day. Feed your baby fish termites or finely ground rice bran, cottonseed cake or groundnut cake when they are in the small pond.



142. If you keep your baby fish in a small pond out of the sun in fresh water and if you feed them each day, they will stay alive for about 5 days. This is enough time to dry and clean and repair the bottom of your big pond, to fill it with water and begin to fertilize it, and to put the baby fish back into your big pond.

143. If you have built your own nursery pond, you will not need these baby fish.

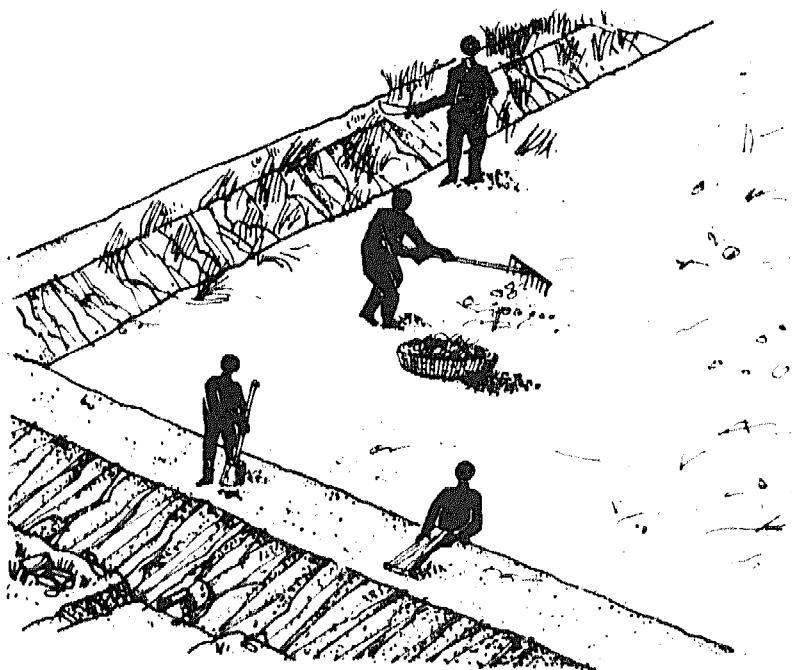
144. If you have more baby fish  
then you can use or sell,  
you can dry them in the sun.  
After you have dried the baby fish,  
grind or pound them and mix them  
with crushed cottonseed or groundnut cake  
or with rice bran to feed your big fish,  
your poultry or your pigs.  
You can also use the baby fish  
to fertilize your farm garden.



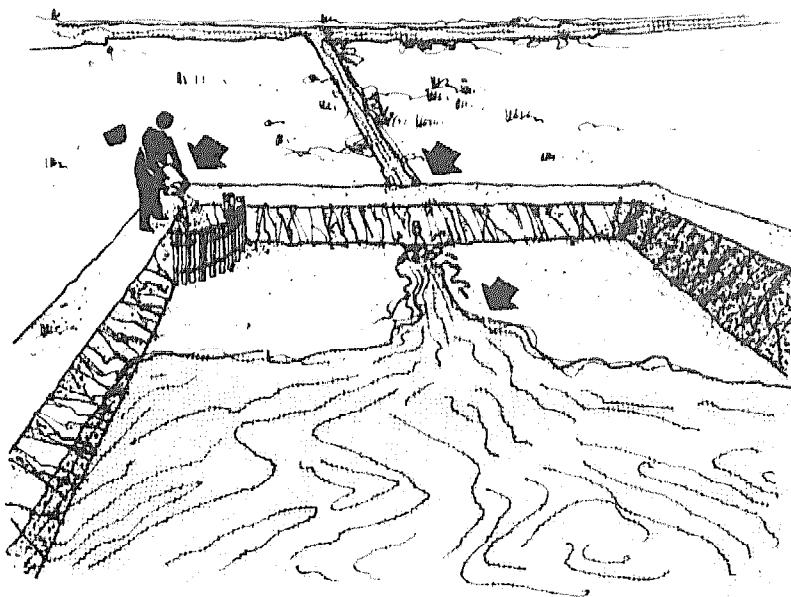
## **NOW YOU MUST BEGIN AGAIN**

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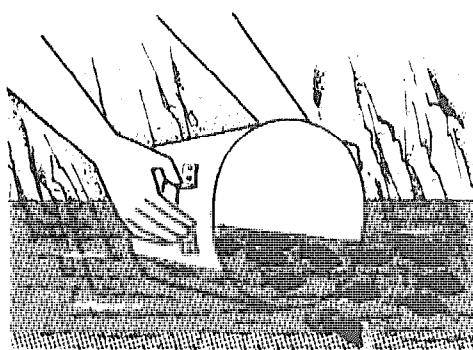
- 145.** If you have drained all of the water from your pond,  
you can clean the bottom  
of the pond.
  
- 146.** But do not let your pond bottom  
become too dry.  
If the bottom of your pond  
becomes too dry, it may crack  
and will not hold water well  
when you are ready  
to fill the pond with water again.
  
- 147.** Repair the banks  
and cut the weeds and grass  
on the banks around the pond.
  
- 148.** If there are any water leaks  
in the banks  
or around the inlet, outlet or overflow,  
stop them by packing them  
with good clay soil.



149. When you are finished,  
let water into the pond  
and fertilize the water  
with animal compost, plant compost,  
animal manure or plant material,  
as you did before.



150. When the pond is green again,  
put 450 baby fish into the pond.  
Use only healthy fish  
which are 5 centimetres or longer.



151. In about 6 months  
you will be able  
to harvest another crop of fish.
152. This booklet has told you  
how to grow more fish  
and how to grow them better.
153. Now that you have built  
your first big pond  
and you have used it  
to grow more fish better,  
you may decide that you would like  
to improve your fish farming even more.
154. Booklet No. 29 has told you  
how to build a bigger pond  
and how to build it better.
155. But there are still more ways  
to improve your fish farming.  
You can
  - build still bigger ponds
  - build more than one pond
  - build new and better kinds  
of inlets and outlets
  - grow fish in several ponds  
in such a way  
that you can harvest fish  
all year round
  - grow fish in pens and cages
  - manage your fish farming  
together with your farm animals  
and gardens and fields  
so that they will be better  
and produce more.
156. You will learn more about these ways  
in a later booklet.

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